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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/618,869

Applicant(s)

FAELDT ET AL.

Examiner

Wenpeng Chen

Art Unit

2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 December 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-124 is/are pending in the application.
- 4a) Of the above claim(s) 60-124 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-59 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/CS-100)
Paper No(s)/Mail Date 4/26/04, 10/29/04
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

Election/Restrictions

I. Applicant's election without traverse of Group I, Claims 1-59 in the reply filed on 12/14/2007 is acknowledged. Claims 60-124 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Groups, there being no allowable generic or linking claim.

Claim Rejections - 35 USC § 102

2. Claims 1, 5, 9, 11-15, 17-22, 24-25, 28-31, 35-36, and 39 are rejected under 35 U.S.C. 102(e) as being anticipated by Liang et al. (US 6,678,413).

Liang teaches a method for assaying plural biological specimens, each of the biological specimens moving within a field of view, (column 10, lines 13-38; Objects, such as mice are monitored with video. To make the video, the objects are moved into a field of view.) the method comprising:

-- for Claim 1, obtaining plural multi-pixel target images of the field of view at different corresponding points in time over a given sample period; (column 10, lines 13-38; column 12, lines 39-55; The digital video contains the images taken over points in time over a given sample period.)

-- for Claim 1, obtaining a background image using a plural set of the plural target images; (column 12, line 55 to column 13, line 11)

-- for Claim 1, for a range of points in time, removing the background image from the target images to produce corresponding background-removed target images; (column 13, lines 29-34)

-- for Claim 1, performing analysis using at least a portion of the corresponding background-removed target images to identify visible features of the biological specimens. (column 13, line 35 to column 14, line 17)

-- for Claim 5, wherein each of the sets of biological specimens comprises plural specimens within a discrete container; (column 24, lines 32-54)

-- for Claim 9, wherein the field of view encompasses an entire area within each of the containers that is visible to a camera; (Fig. 9)

-- for Claim 10, wherein the field of view captures at least a region of interest; (Fig. 9; The area taken is a region of interest.)

-- for Claim 11, wherein the obtaining of a background image comprises normalizing non-moving elements in the plural multi-pixel target images, the plural multi-pixel target images comprising frames of a movie; (Fig. 3; column 10, lines 39-60; column 12, lines 50-55; column 12, line 55 to column 13, line 11)

-- for Claim 12, wherein the obtaining of a background image comprises removing objects from the target images by normalizing non-moving elements in the target images; (Figs. 7b and 7c; column 13, lines 1-11)

-- for Claim 13, wherein the normalizing comprises averaging images among a plural set of the target images; (column 13, lines 1-11)

-- for Claim 14, wherein the obtaining of a background image comprises superimposing two or more of the target images, and then determining a characteristic pixel value for the pixels in the superimposed target images; (column 12, line 39 to column 13, line 27)

-- for Claim 15, wherein the characteristic pixel values comprise averaged pixel values from corresponding pixels from among the plural set of target images; (column 12, line 39 to column 13, line 27)

-- for Claim 17, wherein the plural set comprises all of the images taken during the given sample period; (column 12, line 39 to column 13, line 27)

-- for Claim 18, wherein the removing of a background image from the target images comprises calculating a difference between the target images and the background image. (column 13, lines 28-35)

-- for Claim 19, further comprising further processing the background-removed target images to produce a filtered binary image; (Fig. 8B; column 17, line 35 to column 18, line 6; The label provides the binary information.)

-- for Claim 20, wherein the further processing comprises applying a gray-scale threshold to the background-removed target images; (Fig. 8B; column 17, line 35 to column 18, line 6; The label provides the binary information.)

-- for Claim 21, further comprising further processing the background-removed target images by identifying image blocks and by removing image blocks that are larger than a maximum threshold size and smaller than a minimum threshold size; (column 13, lines 49-55; The object's intensity range inherently defines a maximum threshold size and a minimum threshold size for which the intensity of the foreground object falls between them.)

-- for Claim 22, wherein the maximum threshold size comprises a maximum threshold area, and wherein the minimum threshold size comprises a minimum threshold area. (column 13, lines 49-55; column 19, lines 34-52; The object's intensity range inherently defines a maximum threshold size and a minimum threshold size for which the intensity of the foreground object falls between them. The maximum threshold is associated with the background which is larger than the object. The minimum threshold is associated with the noisy regions in the ROI image which are smaller.)

-- for Claim 24, wherein the performing analysis comprises determining a trajectory of the biological specimens within each of the plural sets of biological specimens, the trajectory being based upon information including the orientation of a given image block representing a given biological specimen, the center of the given image block, the area of the given image block, and a velocity vector representing the velocity of the given image block; (column 19, lines 19-45; column 20, lines 14-24; The mapping of center of an object from a frame to its next frame is a velocity vector.)

-- for Claim 25, wherein the performing analysis comprises determining an orientation of the biological specimens. (column 19, lines 19-45)

-- for Claim 28, wherein the performing analysis comprises distinguishing a given specimen from other biological specimens so behavioral statistics can be correctly attributed to the given biological specimen; (column 22, lines 10-44)

-- for Claim 29, wherein the performing analysis comprises calculating travel distances of the biological specimens. (column 2, lines 47-56; The distance travel is a measure.)

-- for Claim 30, wherein the travel distance is calculated after the biological specimens are caused to move in response to stimulation of the biological specimens; (column 21, line 62 to column 22, line 8; Water is the stimulation.)

-- for Claim 31, wherein the biological specimens are stimulated by subjecting them to an attraction. (column 21, line 62 to column 22, line 8; Water is the attraction.)

-- for Claim 35, wherein the performing analysis comprises calculating turning of the biological specimens: (column 20, lines 14-28; The orientation of the mouse turns from horizontal to vertical.)

-- for Claim 36, wherein the calculating turning of a biological specimen comprises calculating an angle between a velocity vector of a given trajectory of a biological specimen and the subsequent velocity vector of the same trajectory of the same biological specimen. (column 20, lines 14-28; The condition of centroid of a mouse moving up requires inherently analysis of the change of angles of velocity vectors.)

-- for Claim 39, wherein the analysis is performed on every biological specimen of the biological specimens assayed. (column 9, lines 8-20; All of the biological specimens to be assayed are evaluated.)

3. Claims 40-41, 43-44, and 48-52 are rejected under 35 U.S.C. 102(b) as being anticipated by Portmann et al. (US 5,789,242).

Portmann teaches a system for assaying plural biological specimens, each of the biological specimens moving within a field of view, the system comprising:

-- for Claim 40, a holding structure to hold a set of discrete specimen containers;
(column 5, lines 55-67; Fig. 5)

-- for Claim 40, a positioning mechanism to position a plural subset of the containers to place the moving biological specimens within the plural subset of the containers within a field of view of a camera; (column 5, lines 9-40; column 6, lines 46-67; The moving unit 5 moves camera 1 to position 12 to 36 receptacles in the tray within a field of view of the camera.)

-- for Claim 41, wherein the plural biological specimens comprise sets of biological specimens provided in respective discrete containers, some of the containers comprising a reference population of biological specimens and other of the containers comprising a test population of biological specimens; (column 5, line 61 to column 6, line 7; The one with the control solution is reference population of biological specimens *Artemia salina*.)

-- for Claim 43, wherein the discrete containers comprise plates; (column 5, line 61 to column 6, line 7; The tray is also called micro-plate in biochemistry.)

-- for Claim 44, wherein each of the sets of specimens comprises plural biological specimens within a discrete container; (column 5, line 61 to column 6, line 7; A receptacle is a container.)

-- for Claim 48, wherein the field of view encompasses the entire area within the containers of the plural subset as visible to a camera; (column 5, lines 9-40; column 6, lines 46-67; All of the subset of 12 to 36 receptacles in the tray are within a field of view of the camera.)

-- for Claim 49, wherein the field of view encompasses a region of interest. (column 5, lines 9-40; column 6, lines 46-67; All of the subset of 12 to 36 receptacles are under study and therefore a region of interest.)

-- for Claim 50, wherein the holding structure comprises at least one tray of discrete specimen containers; (Fig. 5; column 5, line 61 to column 6, line 7; The holder comprises at least one tray of 96 receptacles.)

-- for Claim 51, wherein the field of view of one camera covers specimens of the plural subset; (column 5, lines 9-40; column 6, lines 46-67; All of the subset of 12 to 36 receptacles in the tray are within a field of view of the camera.)

-- for Claim 52, wherein one camera field of view corresponds to one container within the plural subset. (column 5, lines 9-40; Without further specification, a field of view defined by a receptacle is one camera field of view.)

Claim Rejections - 35 USC § 103

4. Claims 2, 4, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Portmann et al. (US 5,789,242) and Liang et al. (US 6,678,413).

As discussed above, Liang teaches all the features recited in Claim 1. Liang further teaches that the method is applied to study and track all moving objects with a mouse as an example. (abstract; column 9, lines 15-20; column 10, 50-55)

Portmann teaches a system and method for study motion of living moving objects comprising;

-- for Claim 2, wherein the plural biological specimens comprise sets of biological specimens provided in discrete containers, some of the containers comprising a reference population of biological specimens and other of the containers comprising a test population of

biological specimens. (column 5, line 61 to column 6, line 7; The one with the control solution is reference population of biological specimens *Artemia salina*.)

-- for Claim 4, wherein the discrete containers comprise plates. (column 5, line 61 to column 6, line 7; The tray is also called micro-plate in biochemistry.)

It is desirable to evaluate motion of a living moving objects more accurately. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to apply Liang's teaching to Portmann's system for evaluating motion or locomotion activity of living objects because the combination improves accuracy of locomotion analysis.

For Claim 23, Liang teaches the parental Claim 1. Liang further teaches tracking an object including a mouse using eccentricity. (column 19, lines 26-45) In Portmann's system, the *Artemia salina* has a eccentricity value larger than 2 or smaller than $1/2$ as shown as element 100 in Fig. 1. The combination thus teaches:

-- further processing the background-removed target images by identifying an eccentricity value for an image block and then removing image blocks that are larger than double the eccentricity value or smaller than half the eccentricity value.

5. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Liang and Portmann as applied to Claim 2, and further in view of Donaldson et al. (US patent 6,688,255).

Portmann teaches the parental Claim 2.

However, Portmann does not teach transparent vials.

Donaldson teaches an automation system for testing biological specimens with transparent vials to contain samples. (column 1, lines 50-59; column 12, lines 32-43)

It is desirable to store and hold specimens in various kinds of containers for test for experimental flexibility. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to apply Donaldson's teaching to hold Portmann's samples in array of vials for testing, the combination improves experimental flexibility.

6. Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liang et al. (US 6,678,413) as applied to Claim 1, and further in view of Young et al. (US patent 5,885,831).

Liang teaches the parental Claim 1. Liang further teaches study motion activity of living objects.

However, Liang does not teach the features related to "transparent tube" and "drosophila (fruit flies)".

Young teaches a method to study locomotion activity of drosophila (fruit flies), comprising:

- for Claim 6, wherein the biological specimens comprise animals within a transparent tube;
- for Claim 7, wherein the biological specimens comprise flies within a transparent tube;
- for Claim 8, wherein the biological specimens comprise drosophila within a transparent tube.

It is desirable to apply automation to study living objects to make the study more efficiently. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to apply Liang's method and system to study Young's drosophila within a transparent tube, because the combination makes the study of drosophila more efficiently.

7. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liang et al. (US 6,678,413) as applied to Claim 14, and further in view of Ito et al. (US patent 6,088,468).

Liang teaches the parental Claim 1.

However, Liang does not teach the features related to "median pixel value".

Ito teaches a method to track moving object, comprising:

-- for Claim 16, wherein the characteristic pixel values comprise median pixel values from corresponding pixels from among the plural set of target images. (Fig. 14)

It is desirable to have flexibility to use various methods to generate background images for tracking moving objects. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to add Ito's method to Liang's method and system for generating background images, because the combination provides process flexibility.

8. Claims 26-27 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liang as applied to Claim 1, and further in view of Sun et al. (US patent 6,480,615).

Liang teaches the parental Claim 1.

However, Liang does not teach the feature related to velocity vector recited in the claims.

Sun teaches a system for determining optical flow of an object, comprising:

-- for Claim 26, wherein the performing analysis comprises determining a predicted position of a given image block representing a given specimen based on previous position information regarding the given image block plus a prediction factor multiplied by a previous velocity vector; (column 4, line 58 to column 5, line 22; u and v form a velocity vector which is used to predict position of an object in a subsequent frame.)

-- for Claim 27, wherein the prediction factor is between zero and one; (column 4, line 58 to column 5, line 22; The equation at the top of column 5 inherently shows that the weighting factors for u and v are between zero and one.)

-- for Claim 34, calculating a speed of the biological specimens. (column 4, line 58 to column 5, line 22; u and v form a velocity vector which magnitudes are speed.)

It is desirable to more accurately predict position of an object during tracking a moving object. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to apply Sun's teaching to generate optical flow information for tracking Liang's object because the combination improves prediction accuracy.

9. Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liang as applied to Claim 31, and further in view of Heath et al. (US 5,939,062).

Liang teaches the parental Claim 31.

However, Liang does not teach the feature related to light as attraction recited in the claim.

Heath teaches a fact that:

-- wherein a container containing flies, and wherein the flies are attracted toward a given different position with light. (column 5, lines 31-66)

It is desirable to study behavior of flies under exposure to light. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to apply Liang's teaching to place flies in a container and study flies under the influence as pointed out by Heath because the combination improves understanding of behaviors of flies. The combination thus teaches:

-- wherein the containers containing the specimens are moved to cause the biological specimens to move to a repeatable reference position, and wherein the biological specimens are attracted toward a given different position with light.

10. Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liang as applied to Claim 1, and further in view of Brunner et al. (US 2003/0100998).

Liang teaches the parental Claim 1.

However, Liang does not teach the feature related to velocity vector recited in the claim.

Brunner teaches a system for monitoring behavior of an object, comprising:

-- for Claim 33, wherein the performing analysis comprises calculating a path length of the path traveled by the specimens. (paragraphs 0252, 0271, 0281)

It is desirable to more accurately study the behavior of an animal. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to apply Brunner's teaching to generate more behavior information for tracking Liang's object because the combination improves understanding of behaviors of mice.

11. Claims 37-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liang et al. (US 6,678,413).

For Claims 37-38, Liang further teaches using the direction and amplitude of movement to obtain temporal analysis (column 26, lines 9-16).

However, Liang does not teach the feature related to "stumbling".

It is well known to common people that stumbling of an object is a sudden change of motion direction. It would have been obvious to one of ordinary skill in the art, at the time of the

invention, to apply Liang's teaching for evaluating motion or locomotion activity of living objects because the combination provides more information for locomotion analysis.

12. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Portmann et al. (US 5,789,242) as applied to Claim 41, and further in view of Donaldson et al. (US patent 6,688,255).

Portmann teaches the parental Claim 41.

However, Portmann does not teach transparent vials.

Donaldson teaches an automation system for testing biological specimens with transparent vials to contain samples. (column 1, lines 50-59; column 12, lines 32-43)

It is desirable to store and hold specimens in various kinds of containers for test for experimental flexibility. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to apply Donaldson's teaching to hold Portmann's samples in array of vials for testing, the combination improves experimental flexibility.

13. Claims 45-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Portmann et al. (US 5,789,242) as applied to Claim 44, and further in view of Young et al. (US patent 5,885,831).

Portmann teaches the parental Claim 44. Portmann further teaches study locomotion activity of living objects.

However, Portmann does not teach the features related to "transparent tube" and "drosophila (fruit flies)".

Young teaches a method to study locomotion activity of drosophila (fruit flies), comprising:

-- for Claim 45, wherein the biological specimens comprise animals within a transparent tube;

-- for Claim 46, wherein the biological specimens comprise flies within a transparent tube;

-- for Claim 47, wherein the biological specimens comprise drosophila within a transparent tube.

It is desirable to apply automation to study living objects to make the study more efficiently. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to apply Portmann's method and system to study Young's drosophila within a transparent tube, because the combination makes the study of drosophila more efficiently.

14. Claims 53-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Portmann et al. (US 5,789,242) as applied to Claim 40, and further in view of Young et al. (US patent 5,885,831) and Watson et al. (US patent 6,599,476).

Portmann teaches the parental Claim 40. Portmann further teaches study locomotion activity of living objects.

However, Portmann does not teach the features related to that "moving containers to an imaging position of an imaging station".

Young teaches a method to study locomotion activity of drosophila (fruit flies), comprising:

-- wherein the biological specimens comprise animals within a transparent tube as a container.

Watson teaches a sample handling system comprising:

-- wherein tubes (containers) are moved to an imaging position of an imaging station;
(column 9, lines 45-65)

-- wherein the positioning mechanism comprises a conveyor to move containers to an
imaging position of an imaging station; (column 9, lines 45-65)

-- wherein the positioning mechanism comprises a staging mechanism to move containers
through positioned stages, movement from one stage to another resulting in the biological
specimens being forced to a reference position, each stage corresponding to the containers being
at an imaging position of an imaging station; (column 9, lines 45-65)

-- wherein the reference position is the bottom of the container; (column 9, lines 45-65;
Figs. 14-15 show that the bottom of a tube fits into a holder that provides reference of location.)

-- further comprising an identification mechanism to automatically identify each
container; (column 9, lines 45-65; bar code sticker 88)

--for Claim 58, wherein the identification mechanism comprises an identifier provided on
each container, and comprises an identifier reader within a positioning path between a resting
position of the container and the imaging position of the container; (column 9, lines 45-65; bar
code reader 20)

-- wherein the identifier comprises a bar code provided on each of the containers, and
wherein the identifier reader comprises a bar code scanner. (column 9, lines 45-65; See above.)

It is desirable to apply automation to study many living objects to make the study more
efficiently. It would have been obvious to one of ordinary skill in the art, at the time of the

invention, to apply Portmann's method and system to study Young's drosophila within a transparent tube and to apply Watson's sample handling system to move the tubes into the imaging location with ID for automatically identifying the samples because the overall combination makes the study of drosophila more efficiently and with accurate data recording.

The combination thus teaches:

--for Claim 53, wherein the containers of the plural subset are moved to an imaging position of an imaging station;

--for Claim 54, wherein the positioning mechanism comprises a conveyor to move containers of the plural subset to an imaging position of an imaging station;

--for Claim 55, wherein the positioning mechanism comprises a staging mechanism to move containers through positioned stages, movement from one stage to another resulting in the biological specimens being forced to a reference position, each stage corresponding to the containers being at an imaging position of an imaging station;

--for Claim 56, wherein the reference position is the bottom of the container.

--for Claim 57, further comprising an identification mechanism to automatically identify each container;

--for Claim 58, wherein the identification mechanism comprises an identifier provided on each container, and comprises an identifier reader within a positioning path between a resting position of the container and the imaging position of the container;

--for Claim 59, wherein the identifier comprises a bar code provided on each of the containers, and wherein the identifier reader comprises a bar code scanner.

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wenpeng Chen whose telephone number is 571-272-7431. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on 571-272-7453. The fax phone numbers for the organization where this application or proceeding is assigned are 571-273-8300 for regular communications and 571-273-8300 for After Final communications. TC 2600's customer service number is 571-272-2600.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-2600.

Wenpeng Chen
Primary Examiner
Art Unit 2624

March 17, 2008

/Wenpeng Chen/

Primary Examiner, Art Unit 2624